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EUROPEAN HIGH QUALITY LOW ENERGY BUILDINGS

www.EULEB.info

Final report

February 28th, 2007

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Project-No.: EIE-2003-172 EULEB

Abstract

The European research project “EULEB – European high quality Low Energy Buildings” intends to provide information about good examples of energy efficient buildings in use, in order to reduce prejudices and lack of knowledge of many key actors of the building market.

Therefore, a multilingual CD and website was produced, containing detailed information about 25 buildings from all over Europe including measured data about energy consumptions, construction costs, comfort and user acceptance.

150.000 copies of the CD resulting from this work have been disseminated in the beginning of 2007 through European magazines reaching the target groups of architects and engineers as well as investors and property developers all over Europe. Furthermore, all information is available on the website www.EULEB.info.

The project was performed by a European consortium of five Universities and a European umbrella organisation and it was partly funded by the “Intelligent Energy Europe” programme.

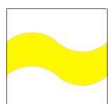
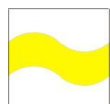
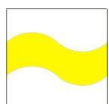


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INTRODUCTION

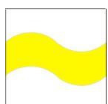
The energy consumption in Europe is rising from year to year. The replacement of limited fossil fuels by renewable energies is proceeding slowly. As a result, the reduction of CO₂-Emissions is proceeding slowly, too.

The building sector plays an important role in the total energy consumption. In order to tap this potential for energy savings and reduction of CO₂-emissions the energy-efficiency of buildings has to be improved as soon as possible.

One important measure to achieve these goals is the legislation for new and existing buildings. With the European “Energy Performance of Buildings Directive” (EPBD), which has to be turned into national laws by the European member states, an important step into this direction has been done.

But unfortunately energy efficient buildings are sometimes facing prejudices and image problems resulting from bad examples from the past. Many people mistrust the real energy efficiency in use, the quality of architecture, the user comfort and the cost effectiveness. Other people just have concerns about energy efficient buildings as a result of lack of information.

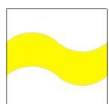
These prejudices and the lack of information can be reduced and eliminated by providing information and detailed data of existing good examples to key actors of the building market. With a collection of 25 European high quality low energy buildings and detailed information about their architecture, their building concept, their measured energy performance and their building costs, EULEB helps to improve the image of energy efficient buildings and supports the implementation of the EPBD.

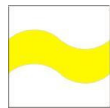


1. Project team

The EULEB project team consists of five European Universities of which the University of Dortmund coordinated the project and one international association. The Universities are represented by different institutes, which are working in the field of energy efficiency of buildings. They have formed a successful research and teaching network in which several projects already have been performed. The excellent knowledge of the team's national building stock allowed a detailed identification of buildings from the five largest European countries.

The sixth partner was REHVA, the Federation of European heating and air-conditioning associations. REHVA is a 43 year old umbrella organisation, representing 30 member associations of European experts for building services. Thus, REHVA has direct contact to about 110.000 key actors of the European building market. They supported the project with the expert knowledge and their network which was used for disseminating the results.



Tab. 1: Project partners


Universität Dortmund
Lehrstuhl für
Klimagerechte Architektur
(Project coordinator)

Prof. Dr.-Ing. Helmut F.O. Müller
Dipl.-Ing. Jörg Schlenger (Management)
Collaboration:
Dr.-Ing. MA Heide Schuster
Dipl.-Ing. Oliver Klein
Andreas Preißler
Anneke Bintig
Dana Augsten
Heike Theilenberg



London Metropolitan University
LEARN

Prof. Michael Wilson
Dott.Arch. Livio Venturi
John Solomon



Università degli Studi di Firenze
ABITA

Prof. Marco Sala
Dott. Arch. Lucia Ceccherini Nelli



Université de La Rochelle
LEPTAP

Prof. Francis Allard
Cristian Ghiaus
Agota Szucs



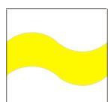
Universitat Politècnica de Catalunya
AiE

Prof. Helena Coch
Arch. Eulalia Cunill
Arch. Oriol Paris



Federation of European heating
and air-conditioning associations

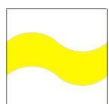
Prof. Olli Sepänen



2. Selection of buildings

A total of 50 public buildings have been identified, predominantly from the countries where the University Partners are situated. To cover the large variety of climatic conditions in Europe, buildings from the very far north (Scandinavia) as well as from the very south of Europe, (Mediterranean countries), were included. Out of the identified buildings, there had to be a selection of five buildings per University Partner for further examination.

For the selection of buildings a simple evaluation system was designed. In this first step, each building was evaluated concerning its qualification to the project. Seven categories (such as quality of architecture, energy consumption, availability of monitored data etc.) with different weightings were used in this subjective evaluation methodology. Low ratings in some of the criteria had to lead to a direct exclusion of a project (for example lack of monitored data).



EULEB - First evaluation of buildings

Building information:

Short Name:

Name:

Country:

Climatic zone:

Occupancy:


Examp

Example building

no man's land

Alwaysnice

Educational



Evaluation:

No.	Criterion	rating	weighting	weighted rating
		1 (bad) to 10 (good)		
1)	Good Design, preferably award winning buildings	5	20%	1,0
2)	Low Energy Consumption (heating, ventilating, cooling, lighting)	8	20%	1,6
3)	Advanced technologies for building and services	2	15%	0,3
4)	Renewable energy utilisation and integration (solar thermal, PV, biomass, geothermal etc)	9	15%	1,4
5)	High comfort solutions (thermal, ventilation and lighting)	1	10%	0,1
6)	Availability of monitored energy consumption or easily measurable	8	10%	0,8
7)	Availability of financial data relating to energy saving features (RUE and RES)	4	10%	0,4
Overall rating			100%	5,6

This evaluation systems leads to comparable evaluation of the suitability of buildings for the EULEB-project. Within the different climatic zones in Europe (south, middle, north), the buildings with the highest overall-ratings should be selected for further treatment. Therefore, the different climates, building technologies and cultural aspects of the European Countries have to be taken into account for the assessment of the several criteria.

Fig. 1: First evaluation of buildings

After having evaluated the 50 identified buildings, a ranking of the buildings identified by each partner could be established, showing which buildings fulfilled the overall criteria best. This process led to the selection of 25 buildings from all over Europe (see table 2).

Tab. 2: List of buildings selected for EULEB

No.	Name	Occupancy	Country	City
1	Gebhard-Müller-Schule	Educational	Germany	Biberach
2	Fraunhofer ISE	Office	Germany	Freiburg
3	FH Rhein-Sieg	Educational	Germany	St. Augustin
4	EnergieForum Berlin	Office	Germany	Berlin
5	Main Office and R.C. of Finnish Forest Research Institute	Office	Finland	Joensuu
6	BRE Office	Office	England	Watford
7	Elizabeth Fry	Educational	England	Norwich
8	Great Notley School	Educational	England	Braintree
9	Kunst Museum	Leisure	Sweden	Kristinehamn
10	Tanga School	Educational	Sweden	Falkenberg
11	Maison de la region Alsace	Office	France	Strasbourg
12	Malta Stock Exchange	Office	Malta	La Valetta
13	County Hall La Rochelle	Office	France	La Rochelle
14	Lycée Polyvalent Albert Camus	Educational	France	Fréjus
15	Lycée Pic St-Loup	Educational	France	St Clément de Rivière
16	New Meyer Hospital in Florence (CSPE project)	Educational	Italy	Florence
17	Bardini Museum	Leisure	Italy	Florence
18	Guzzini headquarters	Office	Italy	Recanati
19	«AVAX» S.A. Headquarters	Office	Greece	Athens
20	Primary School in Empoli	Educational	Italy	Empoli
21	Ethnographic Museum	Leisure	Spain	Güímar, Tenerife (Canary Islands)
22	Centre of Nature	Leisure	Spain	Les Planes de Son (Lleida)
23	SANITAS-BUPA Headquarters	Office	Spain	Madrid
24	National Centre of Renewable Energies	Office	Spain	Navarra
25	Association of Telephone Telecommunications group for Aid and work insertion to Physical Handicapped.	Educational	Spain	Sevilla

3. Selected information

The EULEB project should address to different target groups, namely architects, engineers, investors and property developers. All these groups have a very different knowledge background as well as different interests in terms of building information. As EULEB could never satisfy 100% of the different interests in all details, the challenge was to provide a basic set of general building information. A number of details should address the different target groups and raise the user's interest to search for more information.

The 25 selected buildings were grouped in the three categories "Office", "Education" and "Leisure", whereas office and education buildings have been represented stronger than leisure facilities.

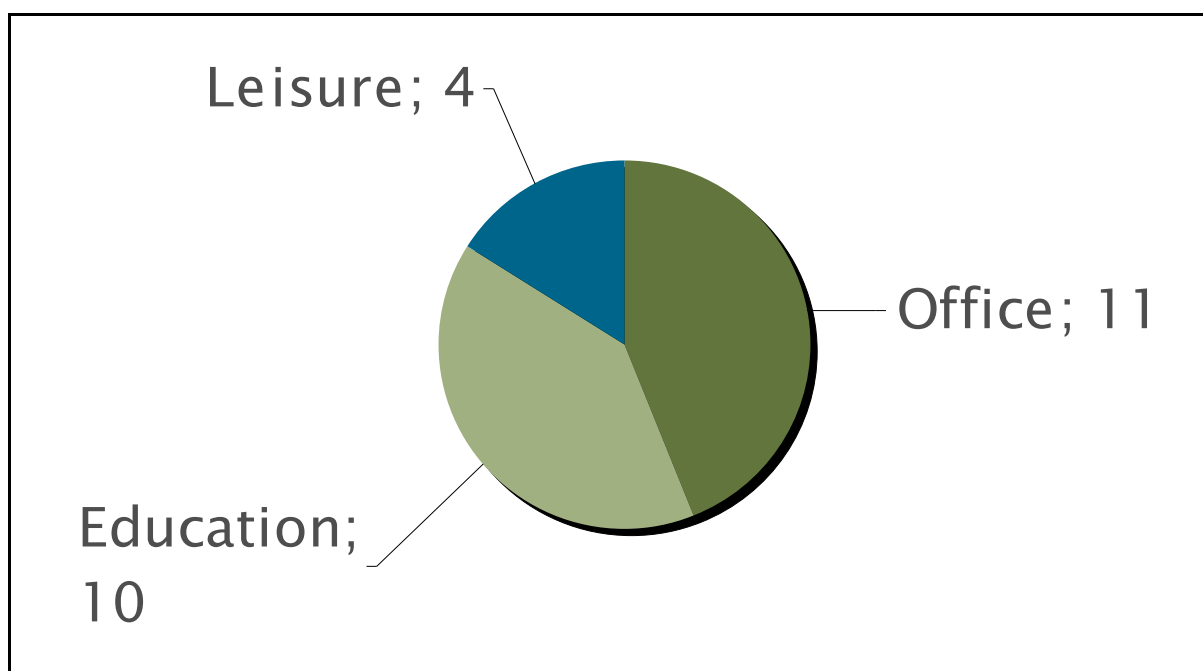


Fig. 2: Distribution of selected buildings to building types

Besides the different building use, the locations of the buildings from all over Europe result in a large variety of differences of the buildings' boundary conditions,

especially in terms of climate. Therefore a visualisation of the buildings locations with reference to the climatic zones of KOEPPEN was used to introduce the user to the influence of locations on the building design and building energy consumption.

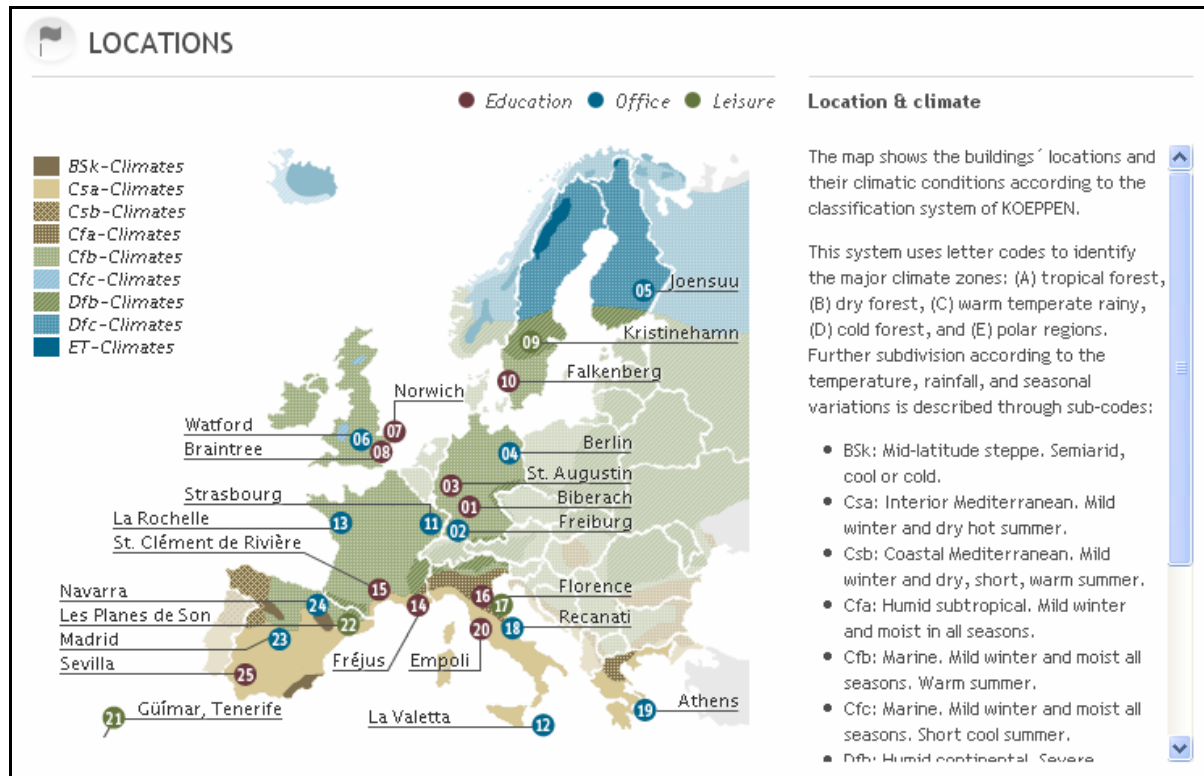


Fig. 3: Locations and climatic zones of selected buildings

Each building presentation starts with some general information about the exact building name, location address, relevant persons involved in the design and construction, information about the buildings' areas and volumes etc. These information are accompanied by images (external and internal views) and plans (site maps, floor plans, elevations and sections) visualising the architecture of the building. To visualise the appearance and the atmosphere of the buildings, short professional video clips provide extra impressions beyond the static images and plans.

The climatic conditions are described in more detail by statistical diagrams and some figures, like the ASHRAE classification which relates the climate to the energy consumption of buildings. The next sections give general descriptions of the build-

ing construction including the thermal quality of the building envelope and the general energy concept and technical systems.

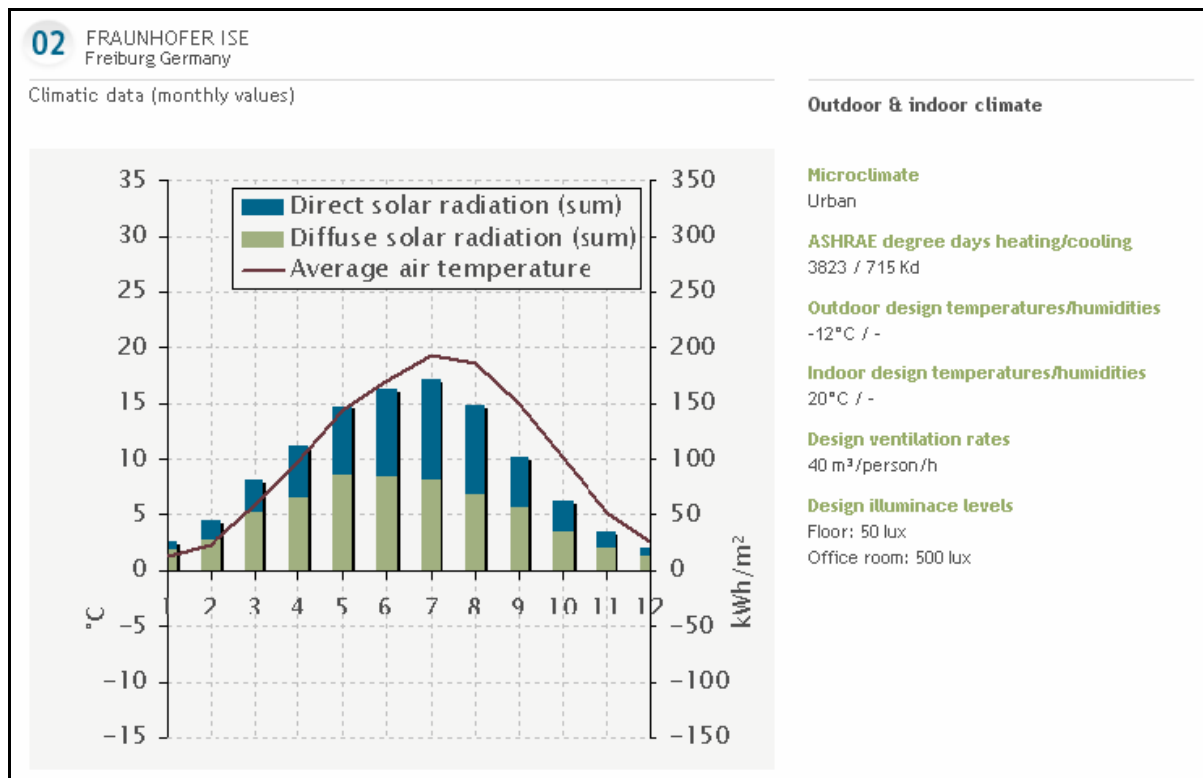


Fig. 4: Climatic conditions in EULEB

Special features of the building concept, which are significant for the energy efficiency of the building, are described and visualised in more detail. These features have been grouped to the categories Insulation, Solar control, Lighting, Heating, Cooling, Ventilation, Materials, Renewable energies, Co-Generation and Rainwater use.

The energy performance of the buildings is evaluated with measured energy consumption. Where available, the consumption is separated by fuel type (electricity, gas, oil etc.) and load type (heating, cooling, ventilation, lighting etc.). This allows giving a detailed overview on the building's energy performance and calculating the respective partly and total primary energy consumptions. All values are related to

the building's usable floor area and compared with national average and standard values where available.

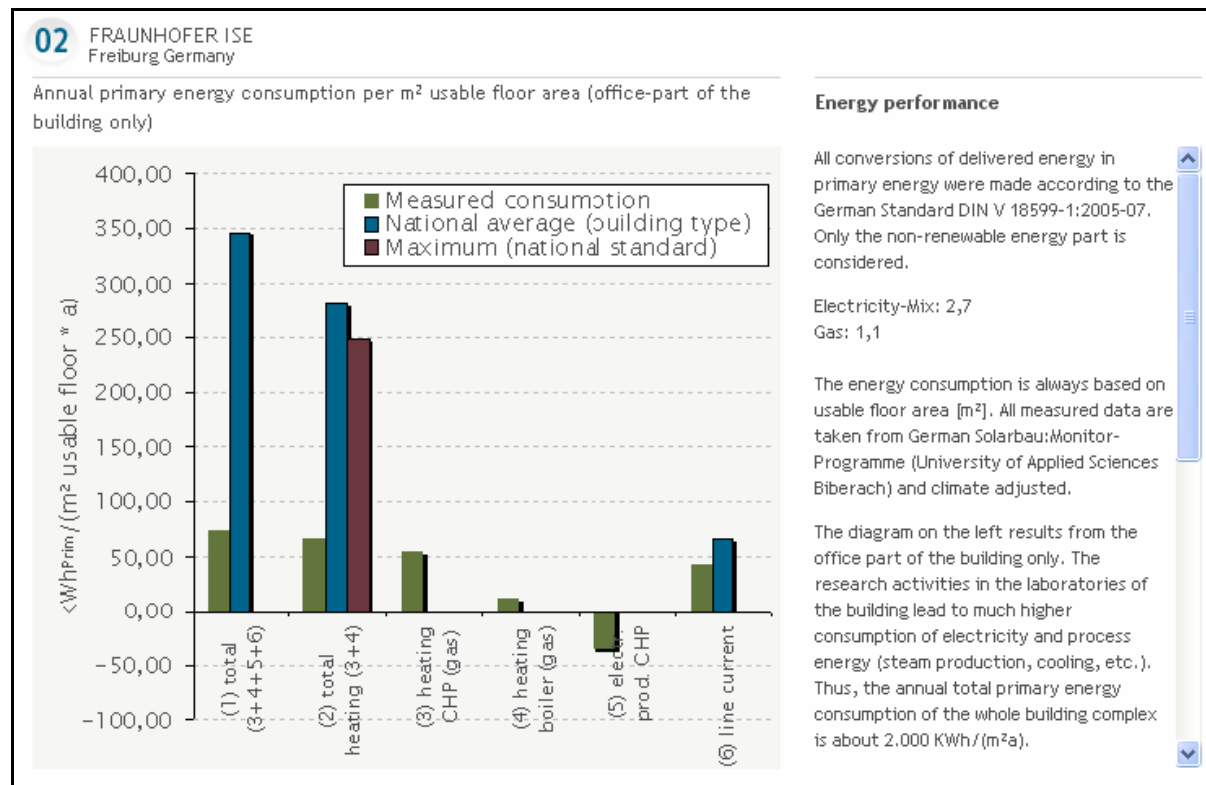


Fig. 5: Energy performance in EULEB

The visual comfort has been measured by luminance pictures, which have been taken and processed for all buildings in the course of the EULEB-project. They give an impression of the luminance and possible glare effects in a typical room of the building.

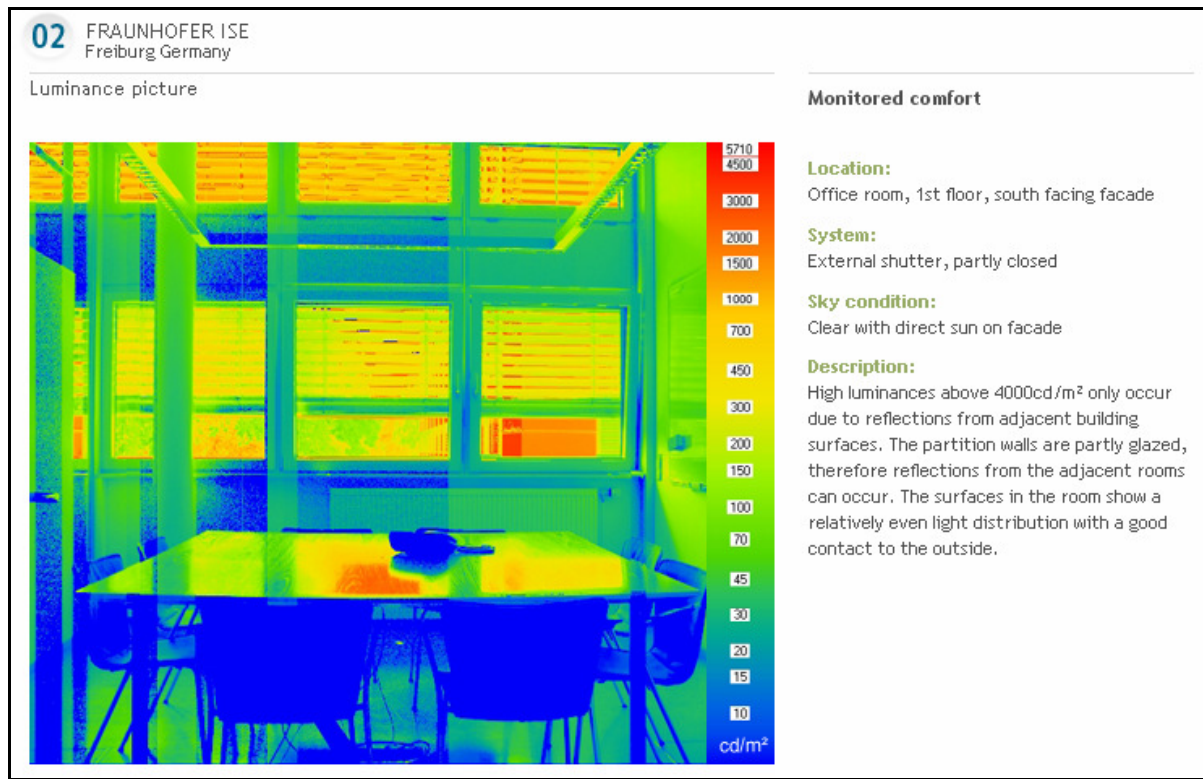


Fig. 6: Visual comfort expressed by luminance pictures

In order to evaluate the quality of the buildings, user acceptance studies have been performed in all 25 buildings. Using a simple questionnaire with 12 questions concerning temperatures, air quality, lighting, comfort, user influence, architecture etc. allowed creating a detailed evaluation and an overall user acceptance.

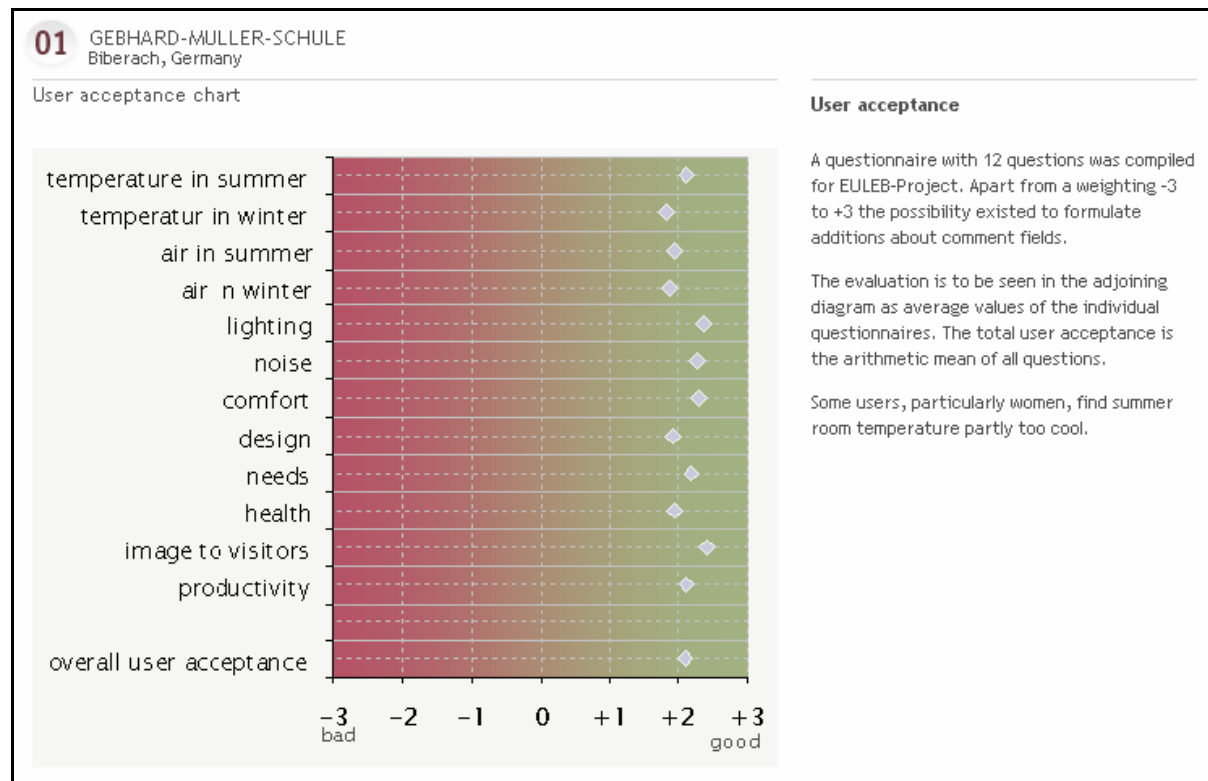


Fig. 7: Results of post occupancy studies

The real building costs have been documented in relation to the usable floor area of the building. Where available, the total costs are divided by cost categories and national average costs for a similar building have been used for comparison.

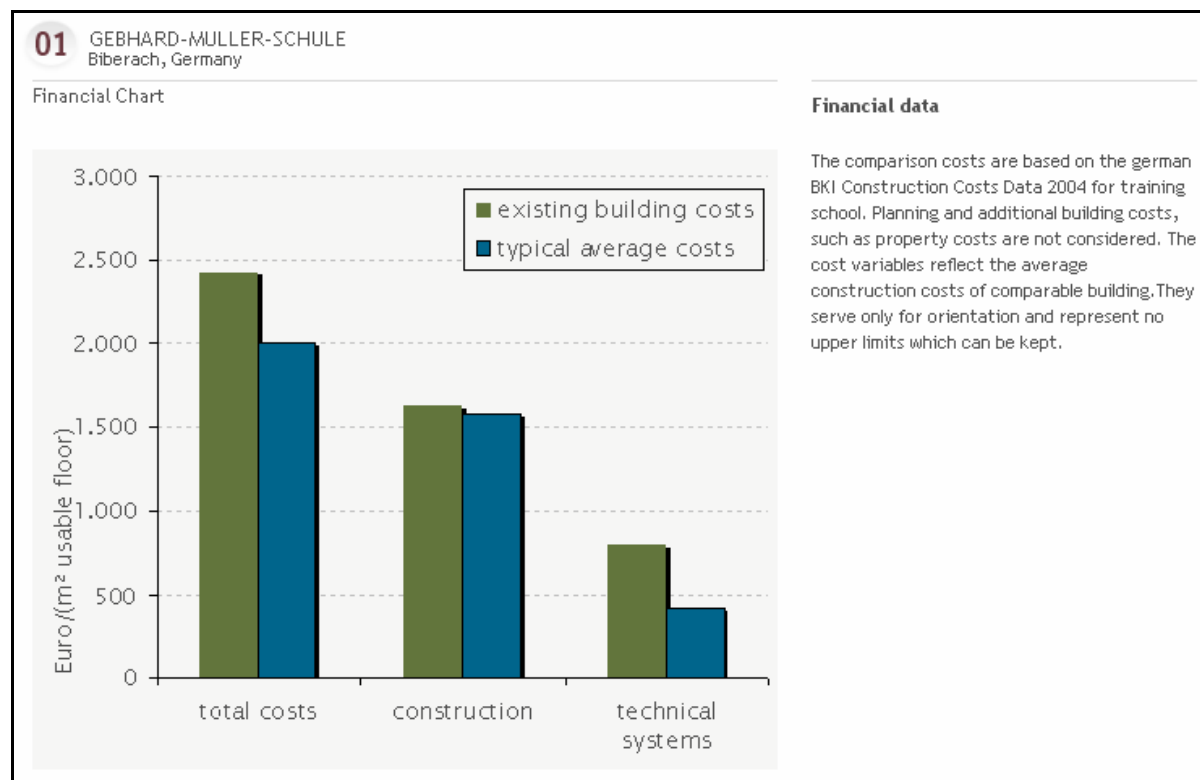


Fig. 8: Building costs in EULEB

Based on the building data described above, the “Benchmarking” section provides a comparison of the building costs, the energy performance and the user acceptance of all 25 buildings. These characteristics depend on many variables such as building use, climatic conditions etc. which have to be taken into account. Thus, in EULEB the buildings have been grouped according to building type and climatic zone. Although this of course does not take into account all relevant parameters (user influences, etc.) a rough comparison could be established.

With this compilation of building data, the general and specific interests in terms of design, technical details, energy performance and costs of the target groups Architects, Engineers and Property Developers have been addressed as much as possible.

4. Access to information

4.1 Multilingualism

The access to the information and data available on the EULEB-Website and –CD should be easy and specific for the various interests and needs of the users from the different target groups.

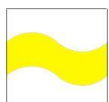
As EULEB addresses key actors from all over Europe, the first priority was to provide all information in the five languages English, German, French, Italian and Spanish. From any point in the CD or website, EULEB allows to swap to the same page in another language by clicking on the flags in the bottom left corner.

4.2 Access by location and building type

The second requirement coming from the European scale of EULEB was to establish a selection according to the buildings' locations, because each building has to be seen against its local background in terms of national standards, culture, climatic conditions etc. Thus, interactive maps showing the 25 buildings together with country borders and climatic zones have been created, allowing a visual grouping of the projects.

Three colours have been allocated to the three building types "Office", "Education" and "Leisure". This colour code is used continuously in all parts of the database and allows fast orientation and differentiation between the building types.

Each building has been given a unique number which is also used continuously for identification of the respective building.



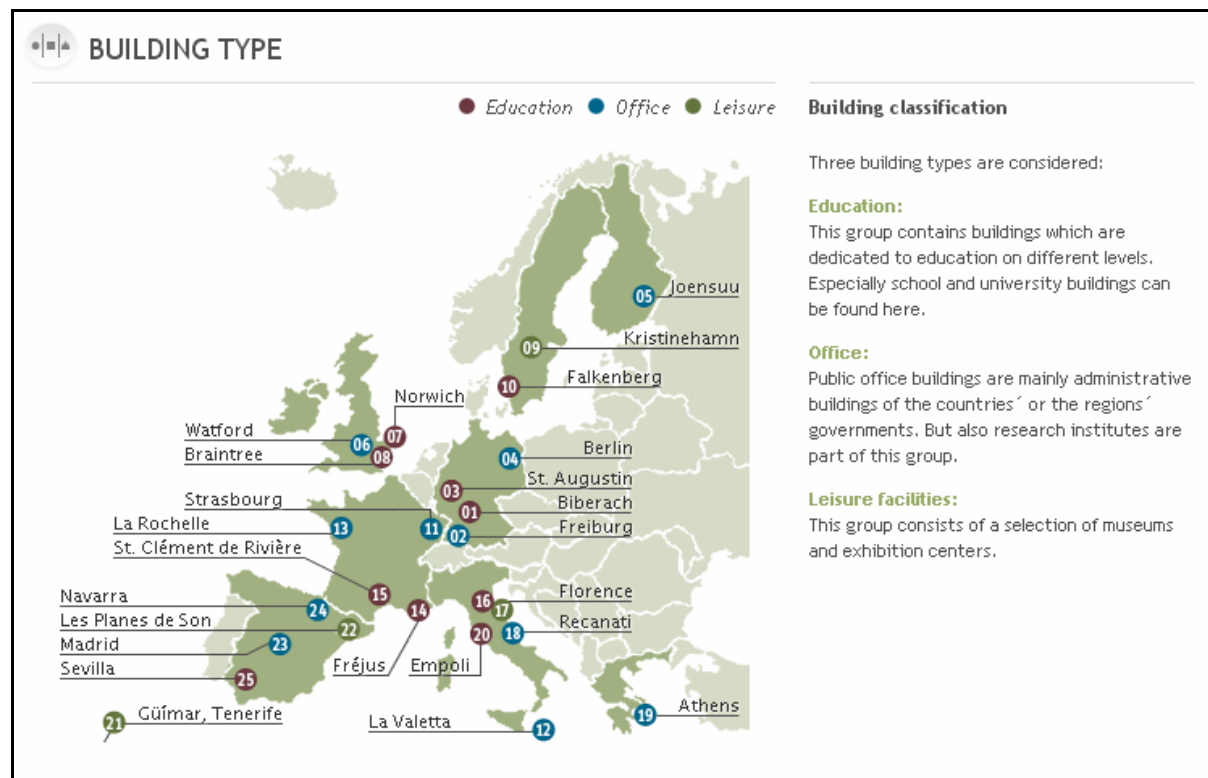


Fig. 9: Interactive map with building locations

4.3 Access by technologies

For users with interest in certain technologies, the buildings can be displayed in ten different groups depending on the special features applied in the buildings: Insulation, Solar control, Lighting, Heating, Cooling, Ventilation, Materials, Renewable energies, Co-Generation and Rainwater use. Therefore, the selection of one of these categories reduces the interactive maps to those buildings, where a special feature of the respective category is applied in. By clicking on a building location in these maps, the user can navigate directly to the description of the respective technology in a building.

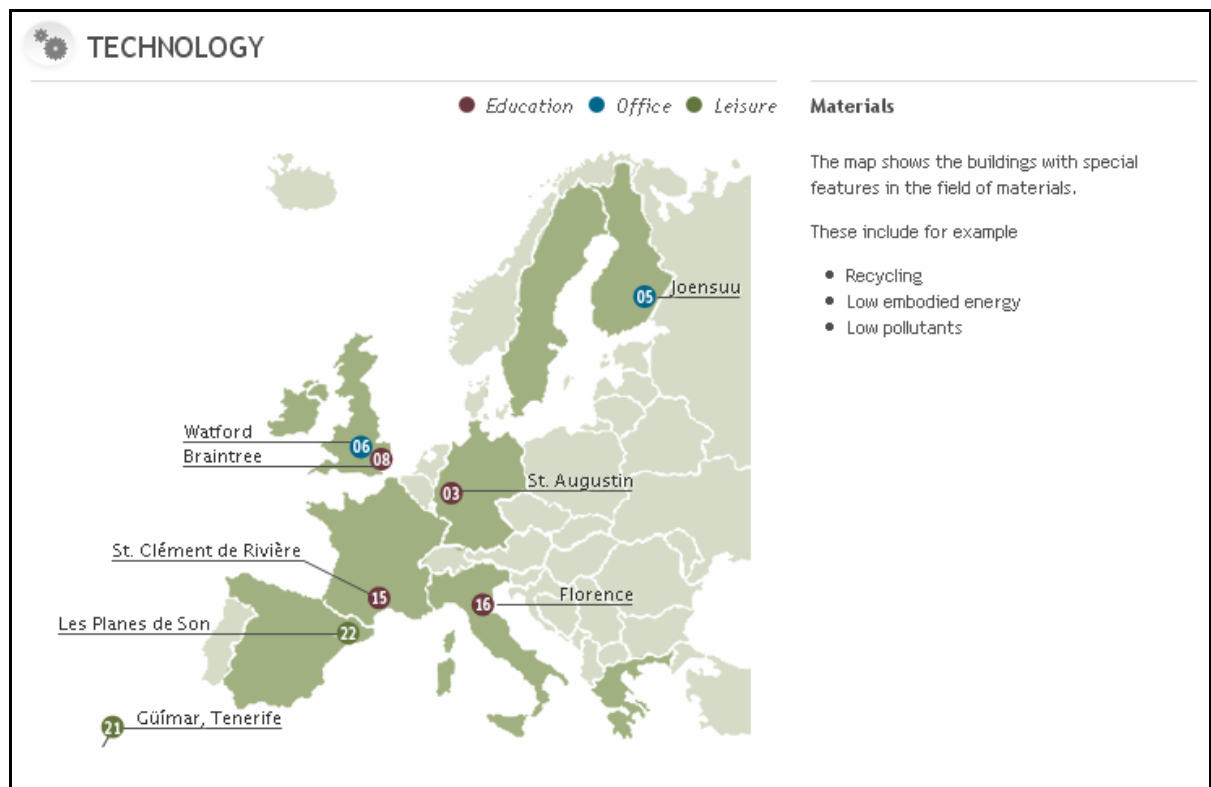


Fig. 10: Interactive map with certain technologies in buildings

4.4 Access by Architecture

To allow a selection by visual impressions of the buildings, a project overview with images of the 25 projects has been established. This interactive matrix gives a quick overview and is supplemented by the colour code of the building types, the building numbers and names. This visual selection is also important for the easy recognition of the projects and to retrieve certain information when using EULEB again.

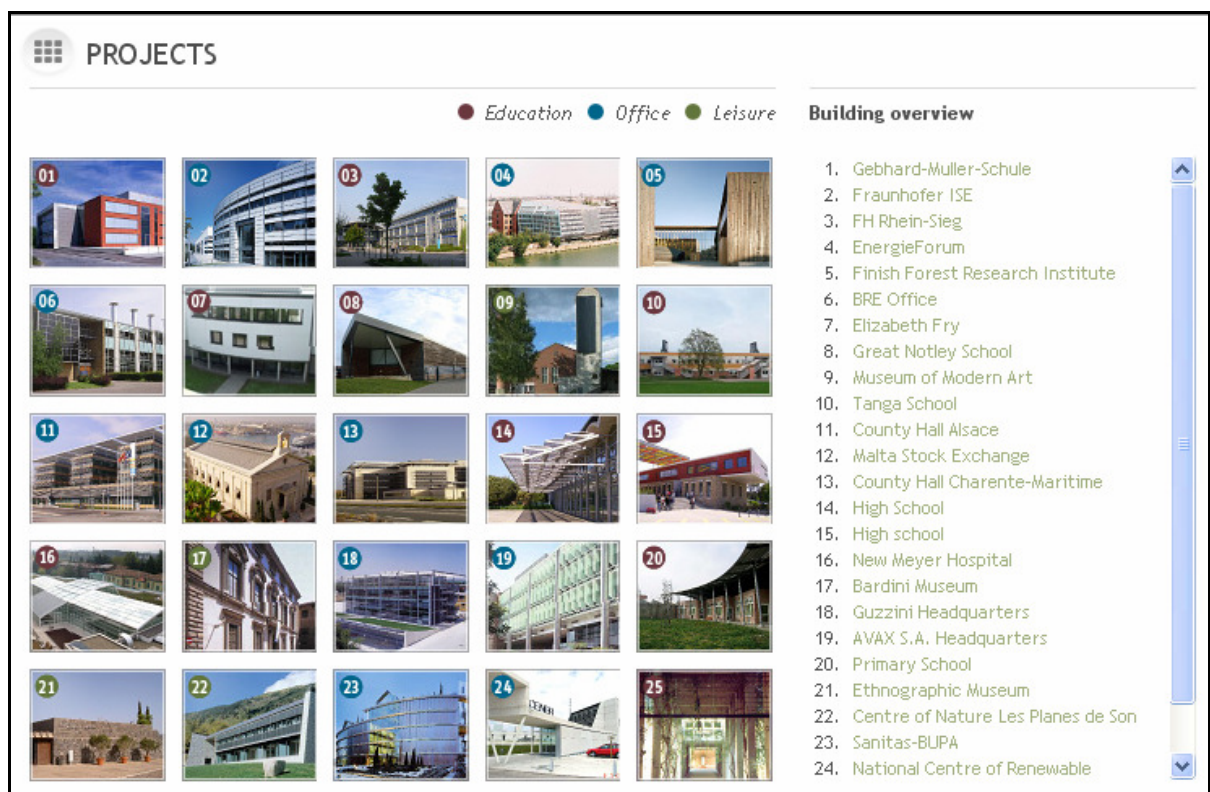


Fig. 11: Interactive matrix with images of the architecture

5. Data collection

5.1 General data

The basic data stock for the building descriptions consists of images, plans and design parameters. As a result of the requirement, that monitored data from at least two years of building use had to be available, all buildings from the building selection had a certain minimum age. Therefore many materials already existed from previous publications.

The material had to be obtained from architects and engineers involved in the planning process, as well as from the building owners and users. Fortunately, most of them appreciated the idea of the EULEB-project and supported the EULEB by providing the required information as far as possible. Still, in some cases external legwork was necessary and had to be contracted.

Based on the availability of information from the selected buildings, the definitive EULEB-contents could be defined. To obtain a homogenous set of data, the collected materials very often had to be adapted to unique standards, which had been agreed within the team. This affected recalculation of values to agreed units, transforming absolute to specific values (for example per m² usable floor area), redrawing of plans and adaptation of images for optimised use in the HTML-surrounding.

5.2 Measured consumptions

The availability of measured energy consumption data was a crucial for the selection of the 25 buildings. Nevertheless, the easiness accessing the data and the available grade of detail varied a lot. Some buildings had perfectly monitored data available, coming from either complex monitoring programmes with a scientific background or just from a detailed facility management system. Other buildings had nothing but bills from the energy delivery available. This made a subdivision by energy use difficult or sometimes even impossible.

Generally it seems that especially for large buildings it becomes a standard to have a detailed building energy management system (BEMS), which provides all data required in a certain grade of detail.

Besides this technical aspect of the data collection, of the agreement of the building owner and / or user to provide these data is essential. As EULEB focussed on public buildings and the agreement was checked in advance, this was not major problem.

5.3 Luminance pictures

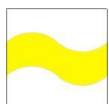
The visual comfort is an important part of building comfort, which very often is neglected when planning or evaluating a building. Nevertheless, the visual conditions have a strong impact on user acceptance, productivity etc. An appropriate measure to evaluate the visual comfort is taking luminance pictures displaying luminances in false colours.

In the 25 EULEB-buildings such pictures have been taken in typical rooms of each building. This was done on the one hand using special cameras, allowing to record the required data in one shot, and analysing the images with a special software. The second technique applied for EULEB was to take a series of exposure bracketed images using a “conventional” digital camera and to create a high dynamic range (HDR) images using the WebHDR-tool developed by London Metropolitan University.

Both methods create luminance pictures allowing to analyse the luminance of any point of the view and thus to evaluate glare effects and other reasons for visual discomfort.

5.4 User acceptance

The user acceptance was analysed by performing post-occupancy-studies in order to evaluate the comfort in the buildings as well as the fulfilment of the requirements of use.



In some buildings the user surveys already had been done using the questionnaires and analysis methods of “Building Use Studies Ltd.”, UK. For the other buildings, an easy questionnaire had been developed, translated to English, French, German, Italian and Spanish and has been used to get comparable feedback from the buildings’ users.

The questionnaires consisted of some easy questions on thermal comfort in summer, thermal comfort in winter, indoor air quality in summer, indoor air quality in winter, visual comfort, acoustic comfort, global estimation of comfort, architectural conception of the building, fulfilment of the users’ expectations, influence of the building on the health of the users, impression of the visitors on the building and influence of the building on the productivity.

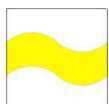
All questions had to be answered by ticking a scale from –3 to +3. The results have been evaluated statistically and an overall user acceptance per building has been calculated.

5.5 Video clips

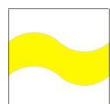
The video clips have been created by three professional teams coming from three different countries. In order to achieve a basic homogeneity of the clips, a basic script for the video clips had been agreed within the team.

For technical reasons, it was decided to have clips without any spoken commentary , interviews or subtitles, which allowed having one language-independent file per building. Still the clips should give a fascinating impression of the buildings in use, the atmosphere, the quality of the architecture and the special features which make these buildings energy efficient.

The result of this challenging task was a new concept, which has been developed in close cooperation between the Chair for Environmental Architecture at the University of Dortmund and the Chair for “camera and film” at the University of Applied Sci-



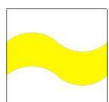
ences, Dortmund. Spoken information have been replaced by a selection of appealing video shots supported by so called “Soundscapes” creating an acoustic atmosphere which fits to the buildings’ atmospheres.



6. Comparison of buildings

The comparison of different buildings generally is a very sensitive process as many different boundary conditions like the use of a building, the climatic background etc. Still then, other factors like the occupants' behaviour will have influences on the results and are very difficult to separate.

In the EULEB project, the 25 buildings have been compared in the section "Benchmarking" in the three main categories "Economy", "Energy" and "Quality". The buildings have been grouped by building type and by climatic zone. The climatic zones have been defined according to the ASHRAE-classification system. This method takes into account the heating and cooling degree days of a certain location and thus takes into account a building's energy demand resulting from climatic conditions.



The Economy–Benchmarking shows a significant variance of the total building costs, within one building type and on climatic zone. But discounting some extreme values, general statements can be found: The total building costs for office buildings constitute generally about 1400 and 2100 €/m² usable floor area). For the educational buildings this value generally reaches between 1000 and 1500 €/m² usable floor area).

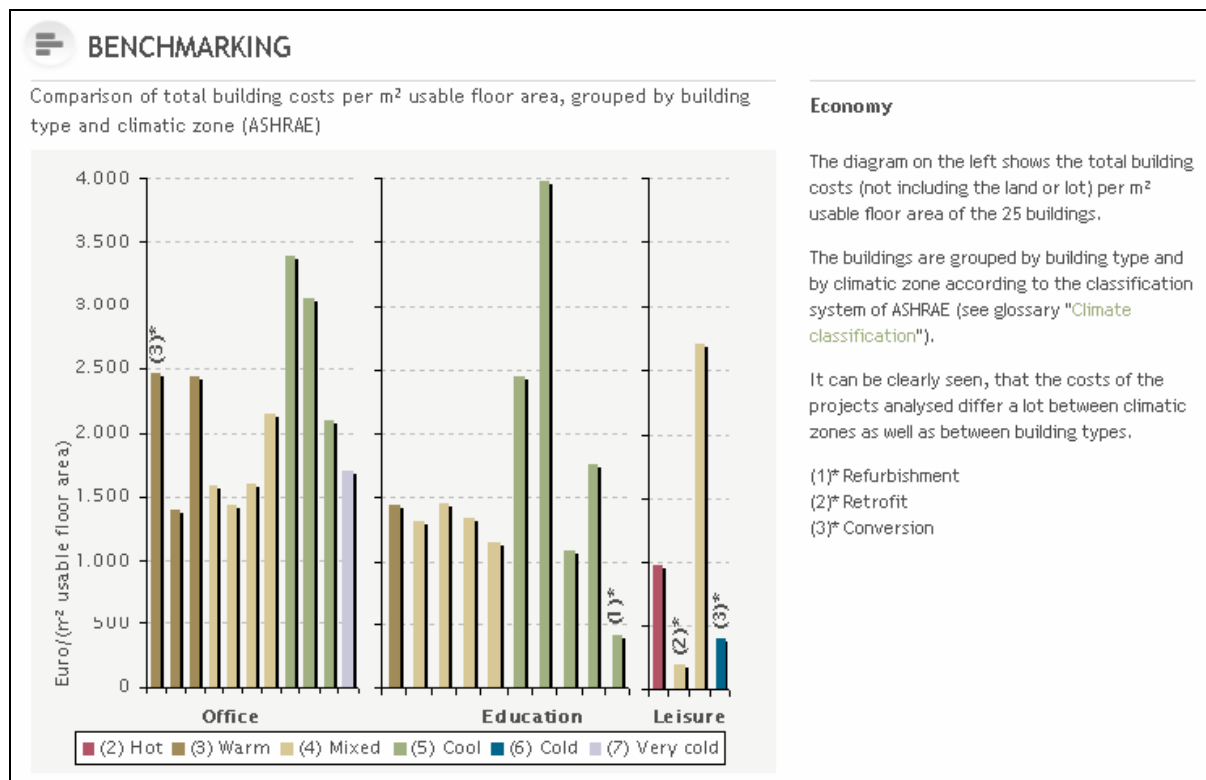


Fig. 12: Comparison of building costs in EULEB

Comparing the energy consumptions of the 25 buildings again brought a significant variance even within one building type and climatic zone. But again, a general statement could be, that for example for all three building types, a total primary energy consumption between 100 and 220 kWh_{Prim}/(m² usable floor area) can be achieved.

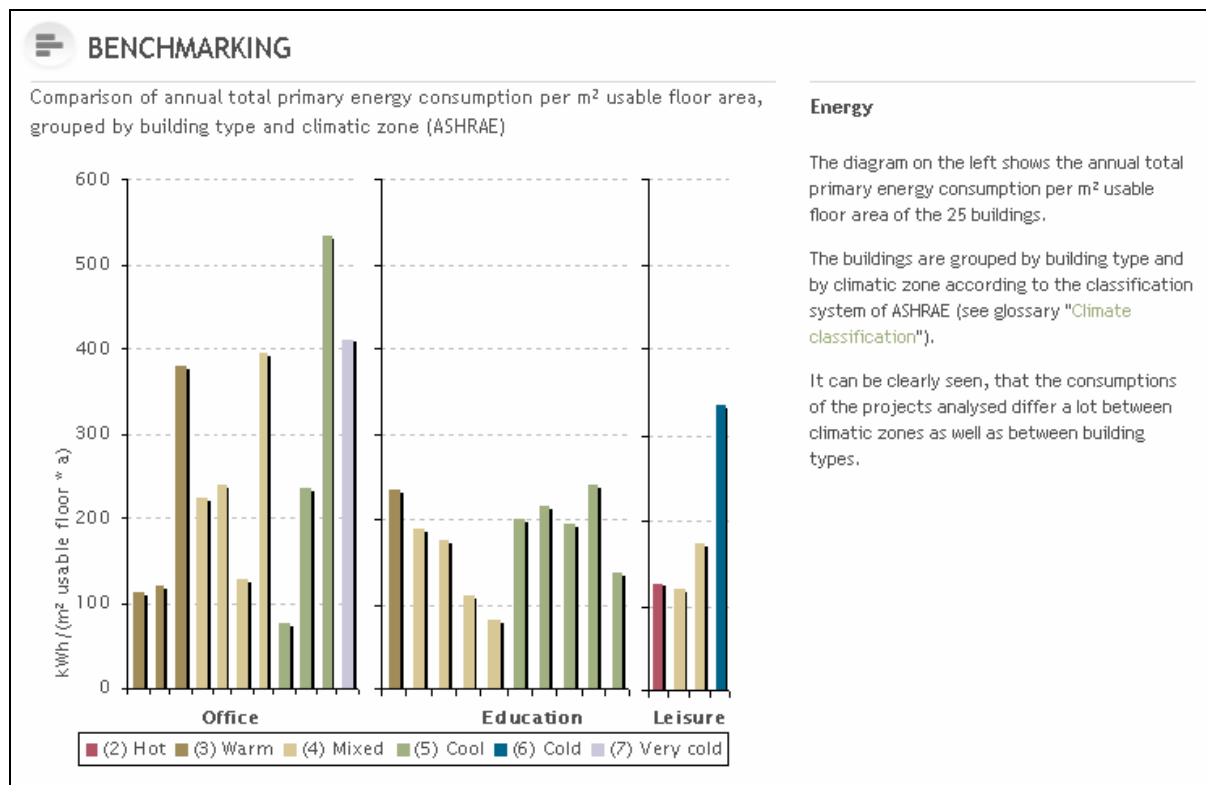


Fig. 13: Comparison of energy consumptions in EULEB

The overall user acceptance has been compared in the Quality benchmarking diagram. Generally positive results are obvious, independent of the building type and the climatic zone.

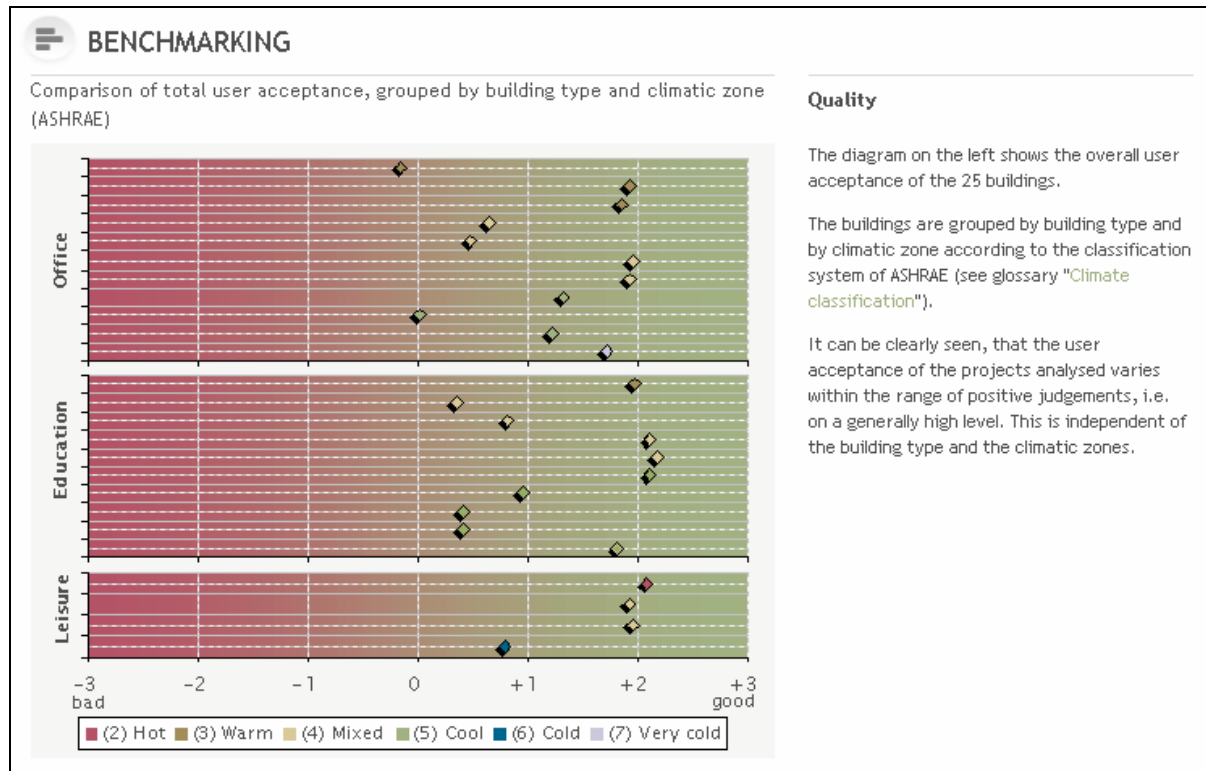


Fig. 14: Comparison of overall user acceptance in EULEB

7. Dissemination of results

During the two years duration of the EULEB-Project permanent dissemination activities have been performed in order to arouse interest, inform about the work progress and get feedback from target persons.

With contributions to national and international conferences a large number of target persons could be reached.

Tab. 3: Conferences attended for EULEB-dissemination

Conference	Location	Date
Palenc 2005	Santorini, Greece	19–21 May 2005
WREC 2005	Aberdeen, UK	22–27 May 2005
AIVC conference	Brussels, Belgium	21–23 Sept. 2005
8th REHVA World Congress/ Clima 2005	Lausanne, France	9–12 Oct. 2005
Plea 2005	Beirut, Lebanon	13–16 Nov. 2005
International Solar Cities Congress 2006	Oxford, UK	3–6 Apr. 2006
Energy Performance and Enviromental Quality of Buildings (EPEQUB2006)	Milos Island, Greece	6–7 Jul. 2006
WREC 2006	Florence, Italy	19–25 Aug. 2006
The European City	Sofia, Bulgaria	2–9 Sept. 2006
PLEA 2006	Geneva, Switzerland	6–8 Sept. 2006
CLIMAMED	Lyon, France	20–21 Nov. 2006
EPIC	Lyon, France	20–21 Nov. 2006
5 Oceans Velux	Bilbao	22–23 Oct. 2006
Environment 2007	Abu Dhabi	28–1 Jan 2007
International congress of HVAC&R	Belgrade, Serbia	30 Nov – 2 Dec 2005
Healthy Building conference	Lisbon, Protugal	4–8, June 2006

Additionally, several fairs have been attended and information about EULEB have been presented.

Tab. 4: Fairs and exhibitions attended for EULEB–dissemination

Fair / Exhibition	Location	Date
BAU2005	Munich, Germany	Jan. 2005
MIPIM	Cannes, France	14–17 Mar. 2006
7. TIP Dialog Frankfurt	Frankfurt, Germany	18. May 2006
EXPO REAL 2006	Munich, Germany	23–25 Oct. 2006
Mostra Convegno fair	Milan, Italy	28 Feb– 4 March 2006
Light & Building fair	Frankfurt, Germany	23–27, April 2006
Klima Forum	Ljubljana, Slovenia	28–29, Sept 2006

Articles in relevant magazines have been used to announce the project and also to disseminate the 150.000 copies of the EULEB–CD.

Tab. 5: Magazines used for EULEB–dissemination

Magazine	Date
XIA–Intelligente Architektur + Sonderdruck	07–09/2006
XIA–Intelligente Architektur	21.02.2007
Industriebau	06.03.2007
Immobilienwirtschaft	02.03.2007
Uni–Zet	02.07
FMJ	FEB 07
GUARDIAN WEEKLY SPECIAL ENERGY EDITION	10 th FEB 07
L'ARCA Edizioni	
ALINEA Edizioni	
ACCA Software	
EDICOM Edizioni	
CVC	15.02.2007
Instalatorul	25.02.2007
REHVA Journal	15.03.2007
El Instalador	01.03.2007
El Instalador	03/2007

El Noti Actecir	04/2007
Arquitectos	06/2007
Rehva Journal	June 2005
Rehva Journal	September 2006
Rehva Journal	December 2006

Several national seminars have been arranged during the project as well as at the end to present the final CD.

Tab. 6: Seminars arranged for EULEB–dissemination

Seminar–name	Location	Date
EULEB	Frankfurt	08.12.2006
EULEB	London	17/1/07
EULEB	Catania	25.11.2006
EULEB	Palermo	6.09.2006
EULEB	Cagliari	1.10.2006
Revival	Athens	7 Nov 2006
Eco–construction	Saintes	16.01.2007
EULEB	Barcelona, Spain	13/12/2006
EULEB workshop (during REHVA Clima2005 International HVAC Congress)	Lausanne	11.10.2005

Besides that, other activities completed the dissemination bundle in order to reach as many target persons as possible:

Lectures in the Partners’ Universities addressed to architectural and engineering students, the future’s key actors for building design.

Each project partner maintained a website, informing about the project and linking to the general website www.EULEB.info.

The website www.EULEB.info, as a central access point to information about the project, shows a significant variance in use. Although it is difficult, to allocate exactly

one of the numerous dissemination activities to a monthly number of hits, the link between both is obvious.

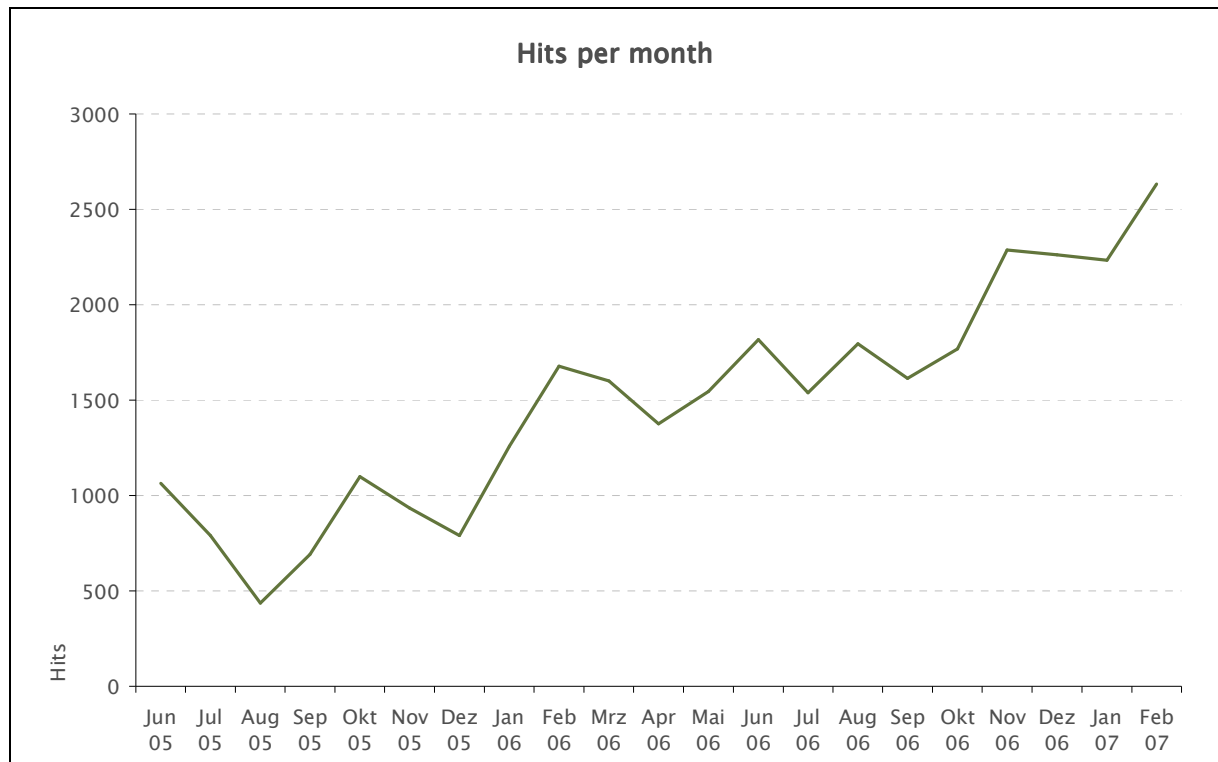


Fig. 15: Hits per month on www. EULEB.info

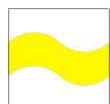
For example the peak in October 2005 can be seen as a result of the successful presentation and workshop during the AIVC conference in Brussels and the 8th REHVA World Congress/Clima 2005 conference in Lausanne.

The increase in May and June 2006 might be a result of the presentations during the Light&Building fair, the Healthy Building conference and the 7th TIP-Dialog.

October and November 2006 was the time of an article "XIA-Intelligente Architektur", the EPIC/AIVC- and ClimaMed-Conference and a series of seminars in Cagliari, Athens and Catania.

Generally an increasing mainstream trend can be clearly seen. When this report was written, most of the final articles (accompanied by the 150.000 CDs) have not been

published yet. Thus a further increase in the months following Feb 2007 can be expected.



Discounting the “Unknown”, “Network”, “Commercial” and “International” domains, which can not be allocated to countries for technical reasons, the distribution by visitor domains / countries shows a predominant interest coming from the European countries of the project partners. But also visitors from other European countries as well as from outside Europe could be recorded. Again, this can be expected to increase in the months following February 2007.

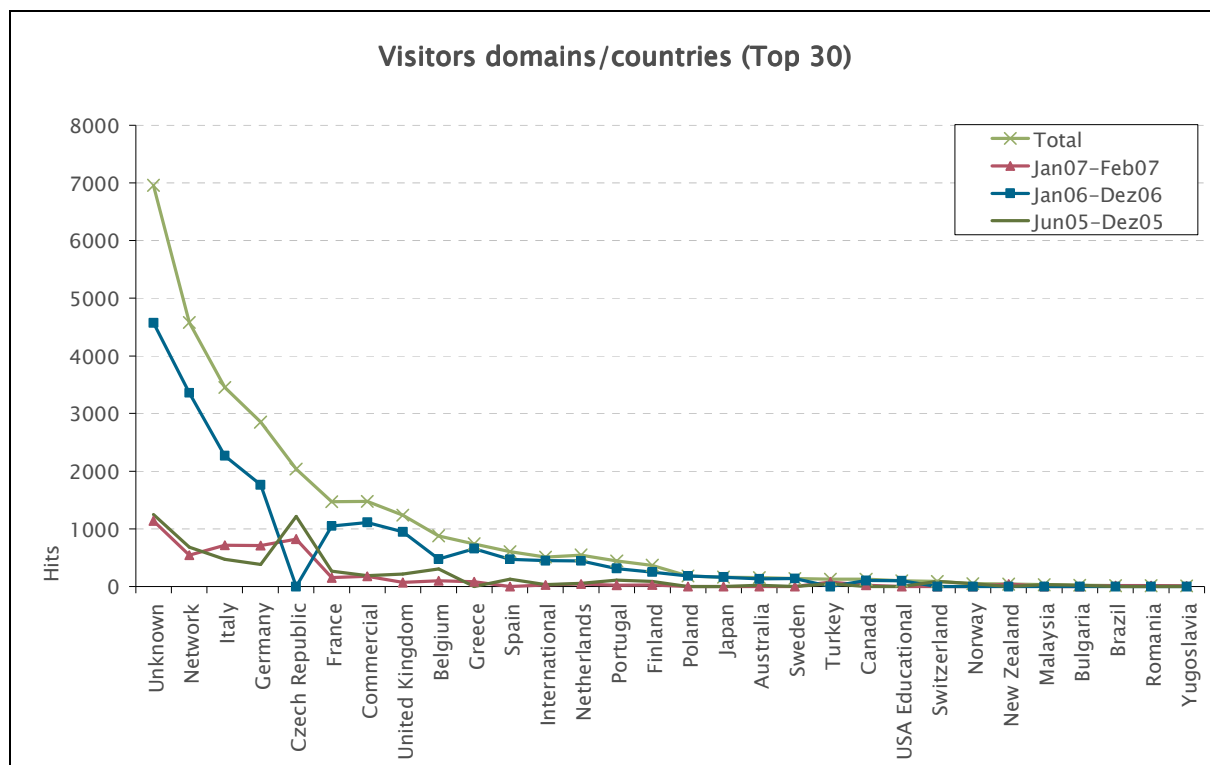


Fig. 16: Hits on www.EULEB.info by visitor domains / countries

8. Conclusions

During the two years period of the EULEB project, an enormous interest in the topic has been experienced. The collection of information on positive examples of energy efficient buildings has been very important for all different kinds of key actors in the building market. In particular there is a strong demand for the combination of “theoretical” information and practical experiences about buildings in use.

This proof for the quality, efficiency and user friendliness of energy efficient buildings was obviously (and still is) of great interest for the target groups addressed by EULEB. The main prejudices in terms of poor architecture, bad energy efficiency, high costs and low comfort could be vitiated, thus the project has been successful.

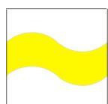
The availability of building performance data was a crucial precondition for this success. The predominantly public ownership of the EULEB-Buildings was certainly helpful concerning the willingness to provide the required data.

For the future it will be important to make such information publicly available from private buildings, too. This would allow interested key actors of the building market to learn from the experiences of their colleagues and thus would accelerate the improvement of building energy performance.

The upcoming energy labelling of buildings postulated by the Energy Performance of Buildings Directive (EPBD) can be seen as a very important step towards this goal. From the results of the EULEB project, this can be seen very helpful to increase the acceptance and spread of energy efficient buildings and help to reduce the energy consumption and the CO₂-emissions of buildings.

9. Disclaimer

The sole responsibility for the content of this report lies with the authors. It does not represent the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained therein.



10. Annex / Deliverables

The annex lists the deliverables according to the Grant Agreement. Some deliverables will just refer to the EULEB-CD and -website, as the results of the work can be found there. All other deliverables will be submitted electronically with the filenames listed in the following tables.

10.1 WPO – Management

Deliv. Name	Partner	Details			
		Meeting No.	Meeting location	Meeting date	Filename
Attendance list and minutes of meetings					
	UDO	01	London	12.01.2004	Minutes_Prelim-Meeting_London_20050121.pdf
	UDO	02	Dortmund	21.03.2005	Minu-tes_Meeting02_Dortmund_20050321.pdf
	UDO	03	Santorini	18.05.2005	Minu-tes_Meeting03_Santorini_20050518.pdf
	UDO	04	London	27.06.2005	Minu-tes_Meeting04_London_20050627.pdf
	UDO	05	Florence	15.07.2005	Minu-tes_Meeting05_Florence_20050715.pdf
	UDO	GD01	Dortmund	26.09.2005	Minutes_Meeting GD01_Dortmund_20050926.pdf
	UDO	06	Lausanne	13.10.2005	Minu-tes_Meeting06_Lausanne_20051013.pdf
	UDO	07	Barcelona	16.02.2006	Minu-tes_Meeting07_Barcelona_20060216.pdf

	UDO	08	La Rochelle	17.07.2006	Minu- tes_Meeting08_La_Rochelle_20060 717.pdf
	UDO	09	Brussels	30.10.2006	Minu- tes_Meeting09_Brussels_20061030 .pdf
		Report no.	Reporting period	Submission date	Filename
Interim report					
	UDO	IR	01.01.05– 31.03.06	14.09.2006	Various, N/A
		Report no.	Reporting period	Submission date	Filename
6-month progress reports					
	UDO	PR1	01.01.05– 30.06.05	08.09.2005	various, N/A
	UDO	PR2	01.07.05– 31.12.05	18.04.2006	various, N/A
	UDO	PR3	01.01.06– 31.06.06	14.09.2006	various, N/A
		Report no.	Reporting period	Submission date	Filename
Final report					
	UDO	FR	01.01.05– 31.12.06	28.02.2007	various, N/A

10.2 WP1 – Identification of buildings

Deliv. Name	Partner	Details
		filename
Assessment system for selection of identified buildings		List_of_criteria_for_evaluation.pdf
		filename
List of chosen buildings and design matrix		List_of_identified_&_selected_buildings-03_20070228.pdf
		filename
List and short presentation of buildings not chosen		Evaluation_of_identified_buildings_UDO_20051006.pdf
		Evaluation_LMU.pdf
		Evaluation_of_identified_buildings Univ La Rochelle.pdf
		Evaluation_of_identified_buildings_ABITA.pdf
		Evaluation_sp_buildings.pdf
		Suggestions_REHVA_all.pdf

10.3 WP2 – Data collection

Deliv. Name	Partner	Details
		filename
Set of high quality data and documentation for each building		See EULEB-CD

10.4 WP3 – Visualisation of data

Deliv. Name	Partner	Details
		filename
High quality diagrams and graphics of energy saving methods and energy consumption		See EULEB-CD

10.5 WP4 – CD content management system

Deliv. Name	Partner	Details
		filename
Content management system and graphic design		See EULEB-CD

10.6 WP5 – Creation of videos

Deliv. Name	Partner	Details
		filename
Edited high quality video clips of all buildings		See EULEB-CD

10.7 WP6 – CD construction

Deliv. Name	Partner	Details
		filename
Complete CD with high quality data of 21 – 24 buildings in English version		See EULEB-CD

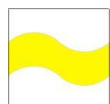
10.8 WP7 – Translation

Deliv. Name	Partner	Details	
		contribution	filename
Translated CD content from English to French, German, Italian and Spanish			
	UDO	Translation to German	See EULEB-CD
	ABITA	Translation to Italian	See EULEB-CD
	ULR	Translation to French	See EULEB-CD
	UPC	Translation to Spanish	See EULEB-CD
	REHVA	Checked translations in English of CD ("English washing")	See EULEB-CD

10.9 WP8 – Dissemination

Deliv. Name	Partner	Details			
		Magazine	Article	Date of publication	filename
Production of 150000 CD´s with high quality data and insertion in relevant magazines, accompagnied by article presenting the project.					
	UDO	XIA-Intelligente Architektur	Energieeffiziente Nicht-wohngebäude in Europa	21.02.2007	UDO_EULEB_Intell-Arch-58.pdf
	UDO	Industriebau	Energieeffiziente Nicht-wohngebäude in Europa	06.03.2007	U-DO_EULEB_Industriebau_02-2007.pdf
	UDO	Immobilienwirtschaft	Energieeffiziente Nicht-wohngebäude in Europa	02.03.2007	UDO_EULEB_Immob-Wirtsch_03-2007.pdf
	Abita	L'ARCA Edizioni			Abita_EULEB article.pdf
	Abita	ALINEA Edizioni			Abita_EULEB article.pdf
	Abita	ACCA Software			Abita_EULEB article.pdf
	Abita	EDICOM Edizioni			Abita_EULEB article.pdf
	ULR				bonCdem-seigneur25283_Lemon.pdf
	UPC	El Instalador		03/2007	UPC_Elinstalador.pdf
	UPC	Arquitectos		06/2007	UPC_journal_ES_PUB.pdf

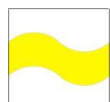
		Association	Way of distributi- on	Date of distirbution	filename
Information about the project and the CD distributed to associations of target groups in Europe.					
	UDO	FIEC	E-Mail	20.04.2005	UDO_E-Mail_FIEC_Paetzold_20050420.pdf
	ULR	REHVA	REHVA Journal.		bonCdem-seigneur25278_REHVA.pdf



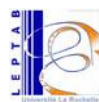
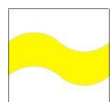
		Magazine	Number of CDs	Date of agreement	filename
Copies of agreements / contracts with the magazines.					
	UDO	XIA-Intelligente Architektur	17800	06/12/2006	UDO_EULEB_Intell-Arch-58.pdf UDO_agreements_xia_06-12-06.pdf
	UDO	Industriebau	3200	07/12/2006	U-DO_EULEB_Industriebau_02-2007.pdf U-DO_agreements_Industriebau_07-12-06.pdf
	UDO	Immobilienwirtschaft	1800	06/12/2006	UDO_EULEB_Immob-Wirtsch_03-2007.pdf U-DO_agreements_Immob-Wirtsch_06-12-06.pdf
	LMU	FMJ	13000	AS INVOICE	
	LMU	GUARDIAN WEEKLY SPECIAL ENERGY EDITION	19000	AS INVOICE	
	Abita	L'ARCA Edizioni	5100	22/12/2006	Abita_L'arca.pdf
	Abita	ALINEA Edizioni	15000	11/12/2006	Abita_Alinea.pdf
	Abita	ACCA Software	8000	21/12/2006	Abita_Acca.pdf
	Abita	EDICOM Edizioni	1900	23/12/2006	Abita_Edicom.pdf
	ULR	El Instalador	(ES)		bonCdem-seigneur25281_El_Instalador.pdf
	ULR	Instalatorul	(RO)		bonCdem-seigneur25280_ARTECNO.pdf
	ULR	CVC	(FR)		Or-der_Climagora_1525€.pdf
	UPC	El Instalador	18000	03/2007	UPC_Elinstalador.pdf
	UPC	Arquitectos	45000	06/2007	UPC_journal_ES_PUB.pdf

	REHVA	Rehva Journal	Agreement between ULR and the publisher of REHVA Journal to use Rehva Journal to publish CD Rom + Article presenting EULEB project (see ULR)	December 2006	

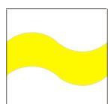
		Association	Number of CDs	Date of distribution	filename
Distribution list of direct distributions to key actors associations. 18					
	UDO	REHVA	150	29.01.2007	UDO_Letter_CDs_to_REHVA_20070129.pdf
	ULR	Distribution list			REHVA_Members.pdf



		Magazine		Date of publication	filename
Articles in relevant magazines (minimum 1 per partner during the 1 year of the project, and 1 per partner to disseminate the results).					
	UDO	XIA-Intelligente Architektur + Sonderdruck		07-09/2006	U-DO_Sonderdruck_XIA_TIP-Forum.pdf
	UDO	XIA-Intelligente Architektur	17500	21.02.2007	UDO_EULEB_Intell-Arch-58.pdf
	UDO	Industriebau	3200	06.03.2007	U-DO_EULEB_Industriebau_02-2007.pdf
	UDO	Immobilienwirtschaft	9000	02.03.2007	UDO_EULEB_Immob-Wirtsch_03-2007.pdf
	UDO	Uni-Zet		02.07	UDO_UniZet_Seite7_02-07_NR.388.pdf
	LMU	FMJ		FEB 07	eulebdis.pdf
	LMU	GUARDIAN WEEKLY SPECIAL ENERGY EDITION		10 th FEB 07	eulebdis.pdf pointer ad.pdf
	Abita	L'ARCA Edizioni			Abita_EULEB article.pdf
	Abita	ALINEA Edizioni			Abita_EULEB article.pdf
	Abita	ACCA Software			Abita_EULEB article.pdf
	Abita	EDICOM Edizioni			Abita_EULEB article.pdf
	ULR	CVC		15.02.2007	EULEB_4_journal_FR.pdf
	ULR	Instalatorul		25.02.2007	EULEB_4_journal_RO.pdf
	ULR	REHVA Journal		15.03.2007	Pa-ges_from_rehva_journal_122006.pdf
	ULR	El Instalador		01.03.2007	
	UPC	El Instalador		03/2007	UPC_Elinstalador.pdf
	UPC	El Noti Actecir		04/2007	UPC_finalflyer.pdf
	UPC	Arquitectos		06/2007	UPC_journal_ES_PUB.pdf
	REHVA	Rehva Journal	Presentation of EULEB project (1 page)	June 2005	Rehva Journal June 2005 - Cover.jpg Rehva Journal June 2005 - EULEB page 15.jpg

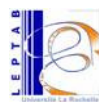
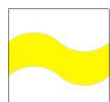


	REHVA	Rehva Journal	Presenta- tion of EULEB pro- ject results (4 pages)	September 2006	Rehva Journal September 2006 – Cover.jpg Rehva Journal September 2006 – EULEB page 25.jpg Rehva Journal September 2006 – EULEB page 26.jpg Rehva Journal September 2006 – EULEB page 27.jpg
	REHVA	Rehva Journal	Presenta- tion of EULEB pro- ject results (3 pages)	December 2006	Rehva Journal December 2006 – Cover.jpg Rehva Journal December 2006 – EULEB page 23.jpg Rehva Journal December 2006 – EULEB page 24.jpg Rehva Journal December 2006 – EULEB page 25.jpg

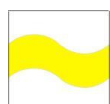


		Seminar-name	Location	Date	filename
National seminars arranged by the partners (minimum 1 per partner and minimum 20 key actors present),					
	UDO	EULEB	Frankfurt	08.12.2006	U-DO_Seminar_Frankfurt_Teilnehmerliste.pdf
	LMU	EULEB	London	17/1/07	Meeting flyer.pdf meeting report.pdf
	Abita	EULEB	Catania	25.11.2006	Abita_conference letter participation.pdf
	Abita	EULEB	Palermo	6.09.2006	Abita_conference letter participation.pdf
	Abita	EULEB	Cagliari	1.10.2006	Abita_conference letter participation.pdf
	Abita	Revival	Athens	7 Nov 2006	Abita_conference letter participation.pdf
	ULR	Eco-construction	Saintes	16.01.2007	Seminar.pdf
	UPC	EULEB	Barcelona, Spain	13/12/2006	UPC_sessiopresentacio131206.pdf
	REHVA	EULEB workshop (during REHVA Clima2005 International HVAC Congress)	Lausanne	11.10.2005	EULEB workshop programme_Lausanne 2005
		Seminar-name	Location	Date	filename
Participation in minimum 1 seminar, workshop, conference in all countries with projects represented in the CD.					
	Abita	EULEB	Florence	21.12.2006	
	LMU	Comfort and Energy Use in Buildings		27-30/4/06	http://nceub.org.uk/uploads/conf_brochure_21feb_06.pdf

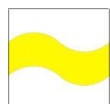
		Conference	Location	Date	filename
International conferences with minimum 150 participants (minimum 1 per partner)					
	UDO	Palenc 2005	Santorini, Greece	19–21 May 2005	UDO_EULEB_Full-paper_PALENC2005.pdf
	UDO	WREC 2005	Aberdeen, UK	22–27 May 2005	U-DO_WREC2005_Poster_Euleb.pdf
	UDO	AIVC conference	Brussels, Belgium	21–23 Sept. 2005	U-DO_Poster_EPBD_20052508_4_A3.pdf
	UDO	8th REHVA World Congress Clima 2005	Lausanne, France	9–12 Oct. 2005	UDO_WS11-EU-LEB_Programme_20050929.pdf UDO_WS11-attendance_list.pdf UDO_WS11-EU-LEB_Workshop_Report.pdf
	UDO	Plea 2005	Beirut, Lebanon	13–16 Nov. 2005	UDO_PLEA2005_P106-v2-t10.pdf
	UDO	International Solar Cities Congress 2006	Oxford, UK	3–6 Apr. 2006	UDO_9D-2-115_EULEB_ISCI2006_JS.pdf
	UDO	Energy Performance and Environmental Quality of Buildings (EPEQUB2006)	Milos Island, Greece	6–7 Jul. 2006	UDO_EPEQUB2006_Paper_EULEB.pdf
	UDO	WREC 2006	Florence, Italy	19–25 Aug. 2006	Abita_conference letter participation.pdf
	UDO	The European City	Sofia, Bulgaria	2–9 Sept. 2006	UDO_E-Mail Akivanov_20060724.pdf
	UDO	PLEA 2006	Geneva, Switzerland	6–8 Sept. 2006	U-DO_PLEA2006_PAPER782.pdf
	UDO	CLIMAMED	Lyon, France	20–21 Nov. 2006	UDO_EULEB_ClimaMed2006_v2.pdf



	LMU	Palenc 2005	Santorini, Greece	19–21 May 2005	
	LMU	8th REHVA World Congress Clima 2005	Lausanne, France	9–12 Oct. 2005	
	LMU	EPIC	Lyon, France	20–21 Nov. 2006	
	Abita	WREC 2006	Florence, Italy	19–25 Aug. 2006	Abita_conference letter participation.pdf
	Abita	5 Oceans Velux	Bilbao	22–23 Oct. 2006	Abita_conference letter participation.pdf
	Abita	Environment 2007	Abu Dhabi	28–1 Jan 2007	Abita_conference letter participation.pdf environment.pdf
	ULR	8th REHVA World Congress Clima 2005	Lausanne, France	9–12 Oct. 2005	
	REHVA	Palenc 2005	Santorini, Greece	19–21 May 2005	
	REHVA	AIVC conference	Brussels, Belgium	21–23 Sept. 2005	
	REHVA	8th REHVA World Congress Clima 2005	Lausanne, France	9–12 Oct. 2005	
	REHVA	CLIMAMED	Lyon, France	20–21 Nov. 2006	
	REHVA	International congress of HVAC&R	Belgrade, Serbia	30 Nov – 2 Dec 2005	
	REHVA	Healthy Building conference	Lisbon, Portugal	4–8, June 2006	



		Fair / Exhibition	Location	Date	filename
Participation in various fairs, exhibitions, etc.					
	UDO	BAU2005	Munich, Germany	Jan. 2005	UDO_Project-Fly-er_BAU2005_deutsch.pdf UDO_Project-Fly-er_BAU2005_englisch.pdf
	UDO	MIPIIM	Cannes, France	14-17 Mar. 2006	UDO_E-Mail_Merschhemke_20060419.pdf UDO_Project-Flyer_MIPIIM_english.pdf UDO_Project-Flyer_MIPIIM_fr.pdf U-DO_MIPIIM2006_Images.pdf
	UDO	7. TIP Dialog Frankfurt	Frankfurt, Germany	18. May 2006	UDO_TIP-Forum_poster_A3.pdf UDO_TIP-Fo-rum_SonderdruckXIA.pdf
	REHVA	Mostra Convegno fair	Milan, Italy	28 Feb- 4 March 2006	
	REHVA	Light & Building fair	Frankfurt, Germany	23-27, April 2006	
	REHVA	Klima Forum	Ljubljana, Slovenia	28-29, Sept 2006	



		Title of lecture	Location	Date	filename
1 regular annual lecture by each university partner.					
	UDO	EULEB	Dortmund, Germany	04.12.2006	UDO_Lecture_WS06-07.pdf
	Abita	EULEB	Florence	20.12.2006	Abita_conference letter participation.pdf
	ULR	Eco-constructions	La Rochelle	27.10.2007	http://www.univ-lr.fr/roles/sciences/formations/gc/i3er.html
	UPC	Projecte EULEB	Barcelona, Spain	20/12/2007	UPC_informacio_seminari 201206.pdf
		Title	URL		
Updated project web-page containing all relevant project documents, Cdcontent etc. (links from partners homepages).					
	UDO	EULEB-Projectoffice	http://www.bauwesen.uni-dortmund.de/lehrst/b1/ka/EULEB/		
	UDO	Research projects in Environmental Architecture	http://www.bauwesen.uni-dortmund.de/lehrst/b1/ka/english/research/ka_research.htm		
	LMU	EULEB	http://www.learn.londonmet.ac.uk/portfolio/2005-2009/euleb.shtml		
	ABITA	EULEB	http://web.taed.unifi.it/abitaweb/euleb/euleb.htm		
	REHVA	EULEB website, creation, maintenance and update	www.euleb.info		
	REHVA	EULEB project webpage on REHVA website	www.rehva.eu		

		Type of event	Type of document	Date	filename
Copies of articles, lectures , agenda and participation list from conferences, and minutes from meetings, and questionnaires in national seminars.					
	LMU	Cd presentation seminar	Seminar papers available at: www.nceub.org.uk		Seminar participation.pdf
	UPC	Lecture	List of participants	13/12/2006	UPC_assistence131206.pdf
	UPC	Lecture/ Seminar	Announcement	13 & 20 /12/2006	UPC_anunci_presentacio13-201206.pdf
	UPC	Lecture/ Seminar	Participation	13/12/2006	UPC_certificat_assistencia131206.pdf

